













# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



# THESIS

R 24805

**HOW FEMALE OFFICERS' PERFORMANCE  
IN NON-TRADITIONAL U.S. NAVY  
SHIPBOARD JOBS COMPARES TO  
MALE OFFICERS' PERFORMANCE**

by

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December 1988

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T242284





Unclassified

Security Classification of this page

## REPORT DOCUMENTATION PAGE

1a Report Security Classification Unclassified		1b Restrictive Markings	
2a Security Classification Authority		3 Distribution Availability of Report	
2b Declassification/Downgrading Schedule		Approved for public release; distribution is unlimited.	
4 Performing Organization Report Number(s)		5 Monitoring Organization Report Number(s)	
6a Name of Performing Organization Naval Postgraduate School		6b Office Symbol (If Applicable) 36	
7a Name of Monitoring Organization Naval Postgraduate School		7b Address (city, state, and ZIP code) Monterey, CA 93943-5000	
8a Name of Funding/Sponsoring Organization		8b Office Symbol (If Applicable)	
9 Procurement Instrument Identification Number		10 Source of Funding Numbers	
10a Address (city, state, and ZIP code)		10b Program Element Number	
		10c Project No	
		10d Task No	
		10e Work Unit Accession No	
11 Title (Include Security Classification) How Female Officers' Performance in Non-Traditional U.S. Navy Shipboard Jobs Compares to Male Officers' Performance			
12 Personal Author(s) Elizabeth Ann Regis			
13a Type of Report Master's Thesis		13b Time Covered From To	
14 Date of Report (year, month, day) December 1988		15 Page Count 46	
16 Supplementary Notation The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
17 Cosati Codes		18 Subject Terms (continue on reverse if necessary and identify by block number)	
Field	Group	Subgroup	
19 Abstract (continue on reverse if necessary and identify by block number)			
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20 Distribution/Availability of Abstract		21 Abstract Security Classification	
<input checked="" type="checkbox"/> unclassified/unlimited <input type="checkbox"/> same as report <input type="checkbox"/> DTIC users		Unclassified	
22a Name of Responsible Individual Nancy Roberts		22b Telephone (Include Area code) (408) 646-2249	
22c Office Symbol 54Rc			

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted

security classification of this page

All other editions are obsolete

Unclassified

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**How Female Officers' Performance in Non-Traditional  
U.S. Navy Shipboard Jobs Compares to Male Officers'  
Performance: A Proposal for Analysis**

by

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Submitted in partial fulfillment of the  
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MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL  
December 1988

## **ABSTRACT**

Analyzing the performance in non-traditional U.S. Navy shipboard jobs and comparing it to male performance was proposed. Almost no research has been done on this important question, and since the number of military women aboard ships is increasing, this data will become increasingly important.

The objective of this thesis is to propose a way in which to analyze the performance of female officers in non-traditional shipboard jobs and to compare that performance to comparable jobs for males. The second objective is to devise a study of greater methodological significance than has previously been attempted. A multi-method approach to measure performance is proposed. This research provides a methodology to test the null hypothesis that there is no difference between the performance of female officers and male officers.

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## **I. INTRODUCTION**

Women first began serving in the U.S. Navy during WW I. In 1916, Secretary of the Navy, Josephus Daniels, asked his legal advisor, "Is there any law that says a yeoman must be a man?" The answer was no. "Then enroll women in the Naval Reserve as yeomen," he said, "and we will have the best clerical assistance the country can provide." Daniels believed that as the U.S. became involved in WW I the Navy would not be able to meet its requirements for clerical personnel. On March 19, 1917, the Navy Department authorized the enrollment of women in the Naval Reserve in the ratings of yeomen, electrician (radio), or such other ratings as might be essential. [Ref. 1:pp. 9-10]

By the end of WW I, 34,000 women had served in the Army and Navy Nurse Corps, the Navy, the Marines, and the Coast Guard. During WW I, not only did women do duty as nurses but for the first time they were brought into traditionally male areas when the services found that they could not obtain the necessary numbers of men. The Navy's new female yeomen—popularly known as "yeomanettes"—not only performed clerical duties but also saw duty with hospital units in France and with intelligence units in Puerto Rico and overseas. The Navy had a special problem when it assigned its yeomen because at that time all yeomen were stationed on ships, but Navy regulations forbade women at sea. To solve the problem, the Navy assigned the female yeomen to anchored tugs. After the war, the women were

demobilized, for their services had always been viewed as temporary.  
[Ref. 1:pp. 4-13]

In mid-1941, the Navy again came to the alarming discovery that it would have a manpower problem if the United States were to be drawn into war. Men would have to be released from bases in the states to man forward bases, thereby creating shortages in the shore establishments. In the months following Pearl Harbor, the Navy and Marines paid a high price in lost lives and were facing large manpower shortages. By the spring of 1942, the Navy had reluctantly concluded that it would have to resort to the use of military women to release men for duty with the fleet.

Despite the need for women to help win the war, there was real opposition—especially in Congress. Fears were expressed about men and women going into battle together and about how men would be more concerned with the women's welfare than with fighting. One member of the House said:

I think it is a reflection upon the courageous manhood of the country to pass a law inviting women to join the armed forces in order to win a battle. Take the women into the armed service, who then will do the cooking, the washing, the mending, the humble homey tasks to which every woman has devoted herself. Think of the humiliation! What has become of the manhood of America?

Despite this reluctance, however, in January 1942, seeing the "handwriting on the bulkhead," the Bureau of Personnel recommended to the Secretary of the Navy that Congress be requested to authorize creation of a women's organization. The Navy bill, P.L. 689,



was signed on 30 July 1942, authorizing the establishment of the Navy Women's reserve. [Ref. 1:pp.9-26]

In WW II, a total of 350,000 military women served in capacities ranging from the usual clerical, administrative, and health-care specialties to airplane mechanics, gunnery and instrument flying instructors, parachute riggers, air traffic controllers, metalsmiths, and airplane ferry pilots. About 800 Women's Airforce Service Pilots (WASPs) flew all types of military aircraft, including combat planes, from one base to another and from continent to continent. These women, however, were not given full military status as aviators, yet one was killed in action when her plane was hit by enemy artillery. [Ref. 1:p. 23]

In the following years, primarily dictated by the availability and requirement for men, women have acted as reserve labor for the Navy and other services. While some women have served in combat zones, at no time in our history have servicewomen officially participated as combat personnel. The exclusion of women from combat duties and their use as auxiliary force in times of emergency reflects the policy of not only the United States' but of virtually all other industrialized nations. In recent years, however, a gradual expansion in the utilization of women has taken place. [Ref. 2:p.3]

In particular, militaries within Western societies have been required to adapt to numerous social and technological changes which suggest an even greater utilization of women in future conflicts. Some of the changes have included modifications of the purpose of

modern-day-armed forces— arising from a blurring of the combatant/non-combatant distinction, evolving demographic patterns, and changing roles for women in society as a whole. [Ref. 2:p.4]

A January 1988 Navy Task Force report on women in the military reports:

Total force readiness requires that all military members, male and female, have an opportunity to develop their talent to the fullest. Because women are a minority of people in uniform (about 10 percent), special efforts are essential to establish that opportunity. Women must be able to compete fairly for assignment and promotion, look forward to rewarding careers if they choose, and be full partners in the benefits of mutual respect among military members that are critical to the effectiveness of military organizations. Attaining those objectives has been complicated by a rapid increase in the number of women in uniform during the past decade and by legal restrictions concerning women in combat, but it is clear that in spite of those complications, military women represent an irreplaceably valuable part of the U.S. Armed Forces.

Department of Defense policy is specific with regard to the effects of the combat exclusion laws. Women are expected to be used in all roles except those explicitly prohibited by the law, and the law should be interpreted to allow as many as possible career opportunities to be kept open.

## **CURRENT LAW AND DOD POLICY**

The legal requirement for combat exclusion arises from two separate statutes—one applying to the Navy and Marine Corps and one to the Air Force:

- Title 10, U.S.C. 6015—Stipulates that “Women may not be assigned duty on vessels or in aircraft that are engaged in combat missions nor may they be assigned to other than temporary duty on vessels of the Navy except hospital ships, transports, and

vessels of similar classification not expected to be assigned to combat missions.”

- Title 10 , U.S.C. 8549— States, “Female members of the Air Force, except those designated under section 8067 of this title, or appointed with a view to designation under that section, may not be assigned to duty in aircraft in combat missions.”

The law does not define “combat mission”; that task has been left to the Department of Defense. Since 1978, the Navy has been integrating women into the crews of noncombatant surface ships, and in recent months the Navy has opened several new units to women: Navy E-2C reconnaissance aircraft and combat logistics force ships [Ref. 3]. Because of the vagueness of the law and the potential for even further openings for women in “non-traditional” jobs, the lack of data regarding the implications of close to full employment for service women in the Navy could be a problem. Non-traditional Navy shipboard jobs are defined as those jobs on ships that prior to 1978 were not open to women. Employment opportunities for women in the Navy are changing rapidly, but no requirements for evaluations to determine women’s performance in these new jobs have been undertaken.

The purpose of this thesis is to set up a study to compare female officers’ performance in non-traditional shipboard Navy jobs to male officers’ performance in comparable jobs. Performance measures proposed for this research will include comparing women to men in the areas of fitness report marks, sick days, education levels, physical fitness test results, supervisor evaluations, peer evaluations, and subordinate evaluations.

Chapter II will comprise a review of the literature relating to this topic and discuss specific studies that have been conducted in the area. Chapter III will consist of the proposed methodology. The final chapters consist of methods of analysis, recommendations, and conclusions.



## II. LITERATURE REVIEW

In 1979, the Canadian Forces (CF) initiated a trial expansion of employment opportunities for servicewomen within its regular force. The main reason behind this trial was the passage of the Canadian Human Rights Act (CHRA) in 1978. The act prohibited discrimination in the employment of an individual on the grounds of gender unless the employer could establish that the discriminatory practice was based on bona fide occupational requirements. The implications of the CHRA for the Canadian Forces were considerable. This legal document dictated that significant organizational changes would have to occur. To hamper the change, there was little information to determine whether this new plan of action would be beneficial. [Ref. 2]

The CF responded to the CHRA by establishing the Service Women in Non-Traditional Environments and Roles (SWINTER) trials. Findings obtained during the trial period, which began November 1979 and ended October 1985, were intended to help make policy decisions on the possible expansion of CF options for women in the future. Servicewomen were assigned duties, on a trial basis, in four operational environments. These included: field service support to primary land combat operations at CF Europe; service at sea in a support capacity aboard a non-combatant ship; support to operations at an isolated communications station located above the Arctic Circle; and as

aircrew at transport and rescue squadrons operating within Canada.  
[Ref. 2]

The principal criterion established for the study was the impact, if any, of servicewomen on the operational effectiveness of the units involved. Collaterally, the SWINTER trials also were designed to:

- a. compare the individual effectiveness of servicewomen versus servicemen for representative work at trial units;
- b. compare the effectiveness of groups of servicewomen versus similar groups of servicemen, and of integrated groups versus all-male groups for representative work at trial units;
- c. assess the behavior and sociological impact, if any, on the immediate families of personnel at trial units;
- d. assess the degree of acceptance of the public and allies for the employment of servicewomen in non-traditional roles and environments; and
- e. determine the resource implications of the expanded participation of servicewomen in the CF.

Two specific evaluations were authorized. First, operational commanders of the trial units were tasked to assess the servicewomen's overall impact on unit operational effectiveness. Second, a social/behavioral science evaluation was conducted by the Canadian Forces Personnel Applied Research Unit.

Evaluation of the SWINTER trials revealed that the issues involved in integrating women into previously all-male operational units are complex. The findings of the evaluation indicated certain problem areas ( e.g., allegations of compromised selection or training standards at CF Fleet School, male resistance to change in the units, initial restricted assignment of tasking, etc.) which can be considered

relatively typical of any initial effort to integrate a minority group within a dominant group [Ref. 2:p. 21]. For example, stereotypical differences between the two genders and the resulting perceived effect on operational effectiveness were frequently noted during the trial period (e.g., men's greater physical strength and aggressiveness, women's fearfulness, emotionality, pregnancy, etc.). Sexuality was also an issue, including rumors both of women's homosexuality and of the impossibility of men and women working together without sexual relationships developing. [Ref. 2:p. 22]

The study concluded that the key element in ensuring that changes ultimately prove effective appears to be to "manage" a successful transition. Whereas it may be relatively simple to diagnose the requirement for new policies and programs and to design a future desired state, it is usually the intermediate stage of initiating movement and introducing modifications which poses the greatest challenge. [Ref. 2:pp. 1-5]

The SWINTER trial was primarily set up to assess the problems associated with bringing women into a formally all-male environment. While an attempt to gauge how well the women performed compared to their male counterparts was made, the measure used to determine this performance was largely the evaluation of the commanding officers of the units. Most of the evaluations were favorable, but no quantitative data was presented. This study begins to address the question of women's performance in a non-traditional role or environment but needs follow-on research.



A study with the scope of the CF trial has not been done in the U.S. Navy, but since the opening of nearly all occupations to U.S. military women in the early to mid-1970s, the role of women in non-traditional Navy jobs (not the performance, however) has received some research support. During the early phase of integrating women into non-traditional jobs, personnel planners asked researchers to develop physical standards for all occupational specialties, especially those with strenuous demands, and to devise methods for measuring the capabilities of men and women to perform these jobs. An initial step in this project was to identify potential “troublesome” jobs—occupational specialties which appeared to involve potentially strenuous and operational demands. Seven jobs were listed for the Navy, including: aviation machinist’s mate, aviation structural mechanic, operations specialist, boatswain’s mate, quartermaster, aviation ordnanceman, and engineman. In efforts to identify the physical standards and requirements for these and all jobs, military psychologists conducted research in this area in all branches of the service. [Ref. 4]

In August 1977, the Navy Personnel Research and Development Center (NPRDC) in San Diego was tasked with developing physical standards for all Navy jobs. After identifying 11,000 demanding job tasks, a taxonomy of 11 Basic Body Efforts was created to cover the 1,000 unique tasks identified. These were translated into the nine tests of the Strength Test Battery. In addition to this undertaking, the researchers at NPRDC and the Naval Health Research Center identified the physical requirements of general shipboard tasks. Other



research areas associated with physical differences between men and women concern human engineering and human factors. Human factors engineers for the Navy have developed several models for workplace evaluation as well as workplace changes to accommodate women. Work conducted in this area has dealt with identifying design problems in the work setting as well as those associated with tools and equipment handling. [Ref. 4]

While these physical considerations are important, military psychologists have also been concerned with the effects upon women's performance in non-traditional jobs of other factors, such as women's aptitude; their interests, attitudes, and values, and the effects of tokenism; and illness and injury [Ref. 4:p. 13]. Military psychologists have made starts in evaluating the effects of fully integrating women into the service. They have learned that women tend to be somewhat less interested in working in non-traditional as opposed to traditional jobs—women have preferred jobs in medical care, technical and allied specialties, and material receipt, storage, and issue, while men preferred aircraft mechanics, radio/radar equipment repair, radar and air traffic control, miscellaneous communications and intelligence specialties, and service and supply, according to a Vocational Interest Career Examination studied in 1976 [Ref. 4:p. 13]. This finding may very well be outdated now that women have the opportunity to serve in more non-traditional roles. Their lack of interest could have been influenced by the fact that they did not have the opportunity to enter any career that had previously been closed to women.

Research has also been conducted in the area of attitudes and values concerning women in non-traditional jobs and roles. In an Army study conducted in 1978, it was reported that most officers and enlisted men and women were in agreement with or highly favored the Army's policy to expand women's roles in nearly all occupations. In another Army study, however, both women and men rated Army women assigned to non-traditional jobs as pushy, masculine, unattractive, and hard. Women also reported that they were treated with little respect by their male counterparts. Another study by During, conducted in 1977, reported that Navy women assigned to non-traditional jobs felt their work gave them greater feelings of self-esteem than was noted for women in traditional jobs. [Ref. 4:p. 15]

Two-thirds of the research on women in the armed forces has been published since 1976. Much of it had focused on intergender differences in attitude and motivation, patterns of aptitude, and anthropometry. Little attention has been paid to the performance of women compared to the performance of men. The scarcity of the research on military women prior to 1970 has been a reflection of their limited number and the resulting low priority given to their problems. A few studies have been done, however. [Ref. 5]

The first of several Navy studies on combat assignments for women was conducted in 1972. Representative samples of male officers and enlisted men along with samples of females were surveyed regarding (1) conscription of women and (2) women's ability to perform on combatant ships. Table 1 presents the responses. Enlisted

women were not in favor of drafting women but half of each of the other three groups supported equal treatment of the sexes in this area. The last question shows more acceptance of women in combat roles. In 1976, 400 active-duty Navy women were asked if they thought women should go into combat. Only 31 percent said "no." [Ref. 5:p. 26]

The Navy, in August 1972, under ADM Zumwalt, promulgated Z-gram 116. In addition to making several changes in the status of women, this policy statement established a pilot program aboard the USS Sanctuary for evaluating the utilization of women at sea. Immediately, a limited number of female officers and enlisted personnel were assigned to the crew. At the end of the first year, the commanding officer evaluated the experience. Enlisted men favored having women on board because it provided a more normal social environment, but the officers felt that there was more of a tendency to congregate and that less work was being accomplished. A team of naval engineers who sailed on the ship to study habitability commented on the high morale of the women. This was attributed to the adventurous spirit of the women and it was thought that in the future women might be more upset by the hardships of shipboard life [Ref. 5:p.40]. But, again, no quantitative data was compiled.

A recent study group under the direction of the Secretary of the Navy and the Chief of Naval Operations was convened in 1987 to conduct an examination which was more comprehensive than any done before to assess the assimilation of women into the naval forces. The



findings from the study were intended to be the basis for use in developing future policies affecting women in the Navy. The issues of sexual harassment and fraternization were identified as being of particular concern to the Secretary. The group was asked to provide recommendations about any policy changes it felt were required as a result of this study. The methodology used in the study, which was conducted by a panel of senior Naval officers, was primarily an interview-based review of 2,500 naval personnel stationed in 10 geographic areas. The locations and types of commands selected were representative of the type and range of duty stations where women served. The sample was composed of males and females of all grades through O-6 and of a cross-section of all ratings. The majority of those interviewed were women, but about 10 percent of the sample were males. [Ref. 6]

The study group concluded with eight major recommendations.

1. Assign Navy women to selected ships of the Combat Logistics Forces—Oilers (AO), Store Ships (AFS), and Ammunitions Ships (AE).
2. Assign Navy women to the aircrew of Fleet Air Reconnaissance Squadrons (VQ) shore-based aircraft.
3. Solve general detailing problems by recruiting to needs, establishing new rating entry procedures, and expanding “A” school opportunities.
4. Revise sea/shore rotation policy (NAVOP 65/87) to increase numbers of women at sea while considering related issues of recruiting, rating entry, advancement, and billet allocations.
5. Establish a full-time captain billet (OP-O1W) to provide oversight for women’s programs.
6. Reduce incidence of sexual harassment within the Navy by emphasizing the importance of women to the Navy’s mission,

improving grievance procedures, and expanding education programs to improve attitudes of Navy males towards women.

7. Promulgate Navy policy on fraternization.
8. Enhance "Quality of Life" by continuing efforts to improve Navy medical care, especially active duty OB/GYN care, and improving child care programs. [Ref.6]

No attempt was made in this study to assess women's performance in the Navy or to compare their performance to male counterparts. Also, the data gathered was all qualitative; no quantitative data was compiled or analyzed.

Despite the breadth of the research reviewed, there are still large gaps in the literature. *Almost no research has been done on the important question of how well female Naval officers perform aboard ships compared to male officers.* As the number of military women increases to a significant proportion of the force, this data will become increasingly important.

### **III. METHODOLOGY**

Methodology: The strategy or architectural design by which the researcher maps out an approach to problem-finding or problem-solving.

The need for research is indicated where the existing fund of knowledge is insufficient to solve a problem [Ref 8:p. 14]. In the continuing debate over how well women officers are performing compared to men in shipboard jobs in the Navy, there are still serious gaps in the research. These gaps limit the ability of policy makers to make informed and unbiased decisions about future policy. This problem, as all problems, becomes a catalyst of research.

#### **A. RESEARCH OBJECTIVES**

The objective of this thesis is to propose a way in which to analyze the performance of female officers in non-traditional shipboard jobs and to compare that performance to comparable jobs for males. The second objective is to devise a study of greater methodological rigor than has previously been attempted. In an attempt to avoid some of the methodology deficiencies of earlier research studies, a multi-method approach to measure performance will be outlined.

#### **B. THE SAMPLE**

The data should be collected about women performing non-traditional roles aboard Navy ships and about men performing the same



jobs. The whole population of women performing non-traditional jobs on Navy ships should be used for the study. It is recommended that the entire population of women be used because the population size is too small to use only a sample. The only women not included would be those who had not been aboard long enough to receive a fitness report. Collecting the data on the women would necessitate gathering information when their ships were in port. Because of the deployment schedules, the team of data gatherers from Navy Personnel Research and Development Center (NPRDC) would be employed for approximately one year to ensure they were able to contact all the ships. Because Navy ships deploy for between five and seven months under normal circumstances, allowing one year for the data gathering would ensure that all ships were surveyed.

When gathering the data on the women officers, the researcher would board the ship (after previously setting up the study with the commanding officer) and set up a schedule for contacting all female officers and their subordinates, peers, and supervisors. This information and the arrangements for the interviewing should be made through the executive officer or his representative. It would be necessary to keep accurate records on the exact number of female officers and the exact jobs they were performing aboard the ship so that this sample could be matched with the male sample.

Collecting data on individual officers using the Officer Master File (OMF) could also be done, but much information needed for this study is not available in these files (peer evaluations, subordinate evaluations,

etc.). Later, the survey data could be matched with the personnel records by a single researcher at a relatively small cost.

The data about the men should be collected from the same ship if they are performing the same job, or from another ship if this is the only way to ensure that men's and women's performance is being compared on the same jobs. Because of the vast difference in the number of male officers serving onboard ships compared to the numbers of women, a random sample of males performing jobs comparable to the female population would be gathered. After the number of females in each job is identified in the first stage of the data gathering, an equal number of male samples would be gathered randomly from comparable ships. Because of the randomness of the deployment cycles, sampling men onboard ships which are in port during the data gathering stage would not violate the assumption of a random sample. For the study, only division-level male and female job information will be compiled because there are too few women performing jobs at the department level in the Navy at this time to get a statistically significant population.

To facilitate a matched comparison sample, a matrix of comparable jobs for both men and women is shown in Table 1.

### **C. MEASUREMENT OF PERFORMANCE INDICATORS**

The first step in this analysis is to decide what indicators accurately quantify performance. Based on previous studies and actual experience in the Navy, the following are considered to be key indicators of performance: fitness report marks, sick days, supervisor



evaluations, physical fitness scores, peer evaluations, and subordinate evaluations.

**TABLE 1**  
**MATRIX OF COMPARABLE MALE AND**  
**FEMALE DIVISION OFFICER JOBS**

<b>JOB</b>	<b>MALE</b>	<b>FEMALE</b>
Operations officer		
Navigator		
Damage Control Assistant (DCA)/		
Damage Control (DC)		
Deck/1st Lieutenant		
Main Propulsion Assistant (MPA)/		
M division		
Boiler Division Officer		
Supply Officers		
Machine Division Officer		
Auxillary Officer		
Electrical Officer		
Communications Officer		

**1. Fitness Reports Marks**

Performance in the military is directly measured by a servicemember's superior in the chain of command in reports called fitness reports (for officers). These reports are done on a semiannual basis for junior officers (O-1, O-2) and on an annual basis for more senior persons. The servicemember's performance is rated by his or her supervisors against other people in the command of the same rank. Data on individual people in the selected environment would

have to be gathered. The overall ranking of an officer, i.e., top one percent, top five percent, etc., would be of most interest in this study. No previous research was found which linked women officer's fitness report marks with overall good performance on the job, but individuals with the best fitness report marks are the ones who get promoted to the higher ranks in the military, thus implying better performance.

## **2. Sick Days**

Good performance from a worker implies that the worker is there to do the work most of the time. When trying to determine how well women perform when compared to men, the consistency of their work must be considered also. There is a direct link between a good worker and a reliable one, for reliability in a military environment is of primary importance.

## **3. Supervisor Ratings**

Perhaps the best and quickest way to gather information about the performance of women and men on the ship is to ask their direct supervisors.

## **4. Physical Fitness Scores**

While there may not be a correlation between fitness and performance for there are no studies to prove it, the Navy believes there is. All Navy personnel are required to be in good shape and pass the semiannual physical fitness test (OPNAVINST 6110.1C ).

## **5. Peer Evaluations**

Sometimes one of the best indicators of performance is the way in which a person is rated by his or her peers [Ref. 8:p.8]. In an

environment such as the Navy where it is important to work as a team, the ability of an officer to influence, work with, and gain the respect of peers is very important.

**6. Subordinate Evaluations**

If you want the clearest picture of a person, ask the person who works for them! Sometimes the most accurate picture of an officer/manager comes from subordinates in the chain-of-command.

Table 2 summarizes the various indicators used to measure performance. Overall performance (P) is computed as a summation of all the individual performance indicators (p1,p2,p3,p4,p5,p6).

**P= p1+p2+p3+p4+p5+p6**

**TABLE 2**  
**PERFORMANCE INDICATORS**

CONSTRUCT	INDICATORS OF PERFORMANCE
PERFORMANCE	SUPERVISOR EVALUATIONS PHYSICAL FITNESS SCORES FITNESS REPORT STATS SICK DAY STATISTICS PEER EVALUATIONS SUBORDINATE EVALUATIONS

**P= p1+ p2+ p3+ p4+ p5+ p6+ p7**

#### **D. DATA COLLECTION**

A team of interviewers from the Navy Personnel Research and Development Center (NPRDC) would gather the information by going directly to the ships. This would reduce many of the problems associated with archival data gathering, such as incomplete information, small numbers of responses, incorrect data, etc. This method would limit the error of data collecting and ensure a high percentage of responses and also make the identification of supervisors, peers, and subordinates very easy. To ensure greater acceptance of the study, all responses would be anonymous.

All initial arrangements should be made through the commanding officer. Later, the interview schedules should be coordinated through the executive officer or his representative, who would also provide information about the numbers of officers aboard the ship and their superiors, peers, and subordinates. The study should be explained to the members of the ship's company in an informal meeting prior to starting the interview schedules. The researchers should stress the fact that all responses would remain anonymous.

Table 3 lists the indicators and the measurement techniques which will be used. They include: fitness report marks, which are collected from supervisor interviews; sick days collected by supervisor interview; physical fitness scores collected by supervisor interview; supervisor rating collected by supervisor interview; peer evaluations collected by peer interviews; and subordinate evaluations collected by subordinate interviews.



**TABLE 3**  
**INDICATORS/MEASUREMENT PROCEDURES**

<b>INDICATOR</b>	<b>MEASUREMENT SOURCE/PROCEDURE</b>
Fitness report	Collected from the supervisor interview. (A semiannual or annual measure of performance on an officer, rating him or her against peers-rating, is done by supervisors in the chain-of-command.) Could also be collected by using OMF files.
Marks	Ranking:
(latest report)	1% recommended for early promotion = 1
	1% regular promotion = 2
	5% = 3
	10% = 4
	20% or below = 5
Sick days	Collected by supervisor interview.
	Ranking:
	no sick days in last six months = 1
	one sick day in last six months = 2
	two sick days in last six months = 3
	three sick days in last six months = 4
	more than three sick days = 5
Scores	Ranking:
	outstanding = 1
	excellent = 2
	good = 3
	satisfactory = 4
	unsatisfactory = 5

**TABLE 3 (Continued)**  
**INDICATORS/MEASUREMENT PROCEDURES**

INDICATOR	MEASUREMENT SOURCE/PROCEDURE
Physical fitness	<p>Collected from the supervisor interview.</p> <p>Ranking:</p> <p>ranked higher than 95% of all officers that have worked for me = 1</p> <p>ranked higher than 90 percent of all officers that have worked for me = 2</p> <p>ranked higher than 75 percent of all officers that have worked for me = 3</p> <p>ranked higher than 50% of all officers that have worked for me = 4</p> <p>ranked below 50% of all officers that have worked for for me = 5</p>
peer evaluations	<p>Collected by interview of all peers on the ship. If an officer has more than one peer, an average of the scores will be computed.</p> <p>Ranked:</p> <p>ranked higher than 95% of all officers I've worked with = 1</p> <p>90% = 2</p> <p>75% = 3</p> <p>50% = 4</p> <p>below 50% = 5</p>

**TABLE 3 (Continued)**  
**INDICATORS/MEASUREMENT PROCEDURES**

INDICATOR	MEASUREMENT SOURCE/PROCEDURE
subordinate evaluations	Collected by interview. If an officer has more than one subordinate, an average score will be computed.
	This officer is ranked higher than 95% of all officers I have worked for = 1
	higher than 90% = 2
	higher than 75% = 3
	higher than 50% = 4
	below 50% = 5

Steps for the researcher:

1. Locate all homeported ships to be used for gathering data on women officers.
2. Contact the commanding officer for permission to do research.
3. Set up research day, time, and location with the executive officer.
4. Board ship with research team.
5. Meet with the executive officer to gather data on numbers of officers etc.
6. Meet with crew to explain study.
7. Conduct interviews.
8. Construct matrix of women's jobs and numbers of women interviewed in each job.
9. Determine the numbers of male officers and types of jobs needed to match the female population.

10. Select the homeported ships to use in the male interview process.
11. Use the same shipboard gathering techniques used in the female study.

#### **E. POTENTIAL PROBLEMS**

1. Potential bias: All situations that involve people ranking others' performance lend themselves to the potential for bias.
2. Because of the ship's deployment schedules, it may take more than one year to complete the study.
3. While data on the whole population of female officers will be compiled, the male population will consist of a random sample. There might be a difference between the random male sample and the male population as a whole because in the whole population every male is tested, but a sample includes only a few males.



## **IV. METHODS OF ANALYSIS**

### **A. NATURE OF THE DATA**

The data gathered from the research will be discrete, ordinal (rank-order), and categorical. Nonparametric statistics will be used to analyze the data (nonparametric: no assumptions are being made about the manner in which the variables are distributed). The SAS programs for descriptive summary statistics could be used to analyze the data.

### **B. DESCRIPTIVE STATISTICS**

#### **1. Measures of Central Tendency**

One of the most useful statistics is the measure of central tendency—a single value chosen to be typical of the collection [Ref 11:p. 55]. With ordinal data, the measures of central tendency which can be computed are the median (computed by dividing the collected scores into two groups of equal size, with half of the measures larger than the median and the other half smaller) and the mode (the category in which more people are found than any other category).

Median = middle value in ordered list

Mode = the data value or values that occur most frequently

#### **2. Kolmogorov-Smirnov Two-Sample Test**

Used for ordinal data which is organized into two independent samples comparing the two Ps—male total scores and female total scores. This test looks at the homogeneity of the distribution and is sensitive to any type of difference in the two distributions: median,

dispersion, skewness. The one tailed test could be used to tell whether the values of one group are generally larger than the values of the other group. [Ref. 12:p. 232]

#### **a. PROC MEANS**

One goal of data analysis is to summarize the data [Ref. 13 p. 48]. PROC MEANS is a SAS procedure which produces simple univariate descriptive statistics for numeric variables. PROC MEANS can compute statistics for an entire SAS data set or separately for groups of observations in the data set [Ref. 13:p. 527]. PROC MEANS can produce the following statistics which would be useful to the researcher: the mean, the standard deviation, the smallest value (MIN), the largest value (MAX), the range, the variance, and the measure of skewness.

#### **b. PROC FREQ**

Large masses of numbers communicate little meaning until they are organized or summarized with one of the techniques of descriptive statistics [Ref. 9:p 26]. One way to arrange data for ease of interpretation is with a frequency distribution. PROC FREQ prints tables of frequency counts, crosstabulations with chi-square, and bivariate measures of association for categorical variables.

1. One-way frequencies: gives the values of the variable and the number of observations corresponding to each value.
2. Two-way crosstabulation tables: Values of the first variable form the rows of the table, and values of the second variable form the columns. When using the SAS PROC FREQ command the researcher can ask for a chi-square test of homogeneity or independence for each two-way table requested in a TABLES statement.

### 3. The Chart Procedures

The SAS chart procedures produce vertical and horizontal bar charts (histograms) which would be useful in the analysis of the data [Ref. 13:p. 603]. Frequency bar charts can be used to divide the data into groups based on the value of a variable. At the bottom of the chart are the two variables and the vertical axis represents the number of observations in the data set containing the value.

### C. HYPOTHESIS TESTING

$H_0$ : No difference between female performance in non-traditional U.S. Navy shipboard jobs and comparable male officer performance.

$H_0: P_F = P_M$

$H_A: \mu_1 \neq \mu_0$

A two-tailed test would be appropriate for this analysis. A two-tailed region of rejection at the .005 level would be

$$R : t \leq -2.660, t \geq +2.660$$

$$\alpha = .005$$

T-tests should be performed on the large P (the summation of all performance indicators) and on each individual performance indicator (p1,p2,p3,p4,p5,p6,p7).

### D. DISCUSSION

Depending upon the outcome of the research, the following issues should be considered.

## **1. No Difference**

Assuming no difference in large P or small p's, the Navy could be confident that its policy of integrating female officers aboard Navy vessels is working.

## **2. Significant Difference in:**

### **a. Large P**

If there is a difference in overall performance, the researcher should consider several factors which may have affected the results. Subjective indicators such as peer evaluations, fitness reports, and subordinate evaluations are all in danger of being negatively influenced by how the largely male population may feel about serving aboard ships with women. Because of this potential bias against women, their performance marks may be lower. In other fields, it has been observed that women were rated lower if they were perceived as not being able to perform up to the same standards as males. [Ref. 14:p. 68]

Another possible explanation for lower large P results for women could be the "self-fulfilling prophecy." If women have negative preconceived notions about their own performance, they may not achieve their full potential. [Refs. 15, 16]

### **b. Small p's**

If there are significant differences in one or more of the small p's, the same factors which could affect the large P should be considered. The performance indicators, fitness report marks, supervisor ratings, peer evaluations, and subordinate evaluations are subjec-



tive and could be influenced by biased expectations on the part of male evaluators, peers, or subordinates. The small p's should be examined individually to determine whether there are significant differences in any indicator, even if the summed p does not indicate a difference in overall evaluation. The varying effects of the small p's, if not examined individually, could cancel each other out, thereby disguising their individual effects.

## **E. MULTIVARIATE ANALYSIS**

Once researchers have measured overall performance (large P), various factors which may influence performance could be controlled for by using data available through the Officer Master File (OMF). Predictors such as length of service, education levels, length of sea duty experience, and age could be matched from the OMF file data and held constant when running the regression equations to measure the independent effect of gender on performance. When choosing a multivariate analysis technique, the analyst should consider the types of measurement scales (categorical and ordinal) and be sure the analysis procedures are designed to fit the data. The performance model could be specified as follows:

$$\text{Performance} = f(\text{gender, length of service, education levels, sea duty, experience, age})$$

where gender = male or female

The independent effect of gender would be tested via the t-statistic on the estimated coefficient.



## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **A. CONCLUSIONS**

Employment opportunities for women in the Navy are changing rapidly, but few studies have been done to assess the performance of women as it compares to the performance of men. More specifically, since women officers began serving aboard Navy ships in 1978, no multi-method approach to studying their performance as it compares to their male counterparts has been undertaken. This data will become increasingly important as greater numbers of ships are opened to women and as women begin to become more senior and start filling the senior shipboard jobs such as department head, executive officer, and eventually commanding officer.

The data compiled to date has been largely anecdotal in nature. Study groups have simply asked the commanding officer of ships that have women aboard to assess their performance. Or studies have focused on the women themselves, asking questions about job satisfaction, incidents of discrimination, etc.

This thesis proposes a way in which to analyze the performance of female officers in non-traditional shipboard jobs and compare that performance to comparable jobs for males and to devise a study of greater methodological rigor than has previously been attempted by incorporating multi-methods—both quantitative and qualitative—in an

attempt to avoid some of the methodology deficiencies of earlier research studies.

## **B. RECOMMENDATIONS**

### **1. Study Design**

A multi-method approach to evaluation design should be used to measure performance. Both quantitative and archival data will be gathered about both female and male officers serving in comparable jobs. Interviews of supervisors, peers, and subordinates will be conducted and data will be compiled from service records of the individual officers.

### **2. Performance Measures**

Based on previous studies and actual experience in the Navy, these are the key indicators of performance: fitness report marks, sick days, education levels, supervisor evaluations, physical fitness scores, peer evaluations, and subordinate evaluations.

### **3. Population**

The data for this study should be collected about women performing non-traditional roles aboard Navy ships and about men performing the same jobs. The data about the men should be collected from the same ship if they are performing the same job, or from another ship if this is the only way to ensure that men's and women's performance is being compared on the same jobs. For the study, only division-level male and female job information will be compiled because there are too few women performing jobs at the department

level in the Navy at this time to get a statistically significant population.

#### **4. Research Staff**

A team of interviewers from the Navy Personnel Research and Development Center (NPRDC) should gather the information by going directly to the ships. This would eliminate many of the problems associated with data gathering, such as incomplete information, small numbers of responses, incorrect data, etc. This method of data gathering would make the identification of peers, supervisors, and subordinates fairly easy.

#### **5. Methods of Analysis**

Methods for analysis should include descriptive statistics, measures of central tendency, and tests of the hypothesis (t-tests).

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